QH
1
N314X
NH

RACCOON
Photograph by C. J. Stine

SMITHSONIAN
SEP 13 1957
LIBRARY

MARYLAND NATURALIST

The Natural History Society of Maryland

VOLUME XXVI Nos. 1 — 4 1956

MUSEUM OF NATURAL HISTORY
MARYLAND HOUSE DRUID HILL PARK
Open daily 10 A. M. to 5 P. M. except Monday.

MARYLAND NATURALIST

Our cover for this issue is an engaging portrait of a "holed" specimen of the raccoon, *Procyon lotor*, made by Dr. C. J. Stine, Maryland naturalist and photographer and staff member of the Natural History Society of Maryland.

The raccoon, a commonly observed native of Maryland, is widely distributed throughout North America south of Canada, occurring in no less than twenty-four subspecies or races. Two of these, *Procyon l. lotor* and *Procyon l. maritimus*, occur in Maryland. The latter, called the Delmarva raccoon, was described by Dozier scarcely eight years ago from the Blackwater National Wildlife Refuge in Dorchester County. It is to be found in marshy areas on the Eastern Shore.

The common raccoon usually frequents woodland areas. It is quite in its element in trees, where it fashions a den in a hollow trunk, raises five or six young a year, and hibernates during the severe cold of winter.

An omnivorous creature, the raccoon feeds on frogs, fish, small mammals, birds, insects, reptiles, eggs, mollusco, fruits, and grain. It most often forages nocturnally, and its tiny, child-like tracks can be found in the mud beside woodland streams throughout the state. Here the raccoon, holding its meal in its agile forepaws, dips its fare in and out of the water in the famous "washing" process for which it is renowned.

According to Dr. Stine, the raccoon's greatest enemies are man and the dog, "..particularly when they join forces on a coon hunt." He further states, "A coon is a tough customer when cornered. I saw a large female walk away from a fracas with six hounds once. Two of the dogs had been disemboweled."

PUBLISHED by THE NATURAL HISTORY SOCIETY OF MARYLAND
2101 - 2103 BOLTON STREET, BALTIMORE, MARYLAND

VOLUME XXVI Nos. 1 — 4

1956

SEP 9 1957

EDMUND B. FLADUNG, 1889 - 1956

The death of Edmund B. Fladung on March 23, 1956 marked the passing of an outstanding naturalist and civic leader whose unfortunate demise was an immeasurable loss to the City of Baltimore and the State of Maryland. A man known widely for his zeal and unbounded enthusiasm in the field of natural history, particularly in regard to his beloved state of Maryland, he exerted a very great influence on the lives of all with whom he came into contact.

"Doc" Fladung, as he was affectionately known to his friends and asso-

ciates, was born in Baltimore on July 1, 1889. As a youth he attended the St. James Parochial School. At an early age, despite an intense desire to continue his schooling uninterrupted, he found it necessary to enter the business world. However, never a man to be delayed where learning was concerned, he attended night classes at various centers in Baltimore and graduated from the evening school of the Polytechnic Institute. At about the same time he also completed the two year course in chemistry offered at the Baltimore City College. In 1923 he received his Bachelor of Science degree from the American International Academy. Then, later in the same year, he was awarded an honorary doctorate in Entomology from the University of Bogota.

In addition to his interest in natural history, "Doc" Fladung was devoted to the arts, and his talents in the field led him to complete the four-year course in architecture at the Maryland Institute. He painted in oils and specialized in the restoration of paintings and ornate frames. His handiwork in this latter respect may be seen in the Jacob Epstein Collection and other works at the Baltimore Museum of Art. His art novelty shop on Saratoga Street became, in later years, a focal point of activity and a gathering place for his many friends who were interested in the natural sciences. These informal gatherings influenced to a large extent the formation of the Natural History Society of Maryland, which "Doc" founded in 1929. His love of literature and music is evidenced by the vast library and collection of recordings which he left behind. To his friends, "Doc" was an enthusiastic student of the Bible, Shakespeare, and the classical German poets. On these topics he was a brilliant and indefatigable conversationalist.

Under his dynamic and purposeful leadership the Natural History Society of Maryland grew from an organization with seven members and a borrowed meeting room to a society of several hundreds of members, with large staff and laboratory quarters and a modest Museum of Natural History.

Prior to his founding the Natural History Society of Maryland, of which he was President from its inception until his death, "Doc" Fladung was an active member and officer of the Maryland Academy of Sciences. It was here that he first specialized in the study of insects, and it was here that he first developed the strong interest in teaching youth which persisted throughout his life. His intensity of purpose and high ideals became the guiding light of many young naturalists who were, as a result of his counseling, imbued with a searching spirit that far outgrew the bounds of their native state. Their names may be found on the staff lists of scientific institutions throughout the country.

Edmund B. Fladung, naturalist, scholar, educator, and civic-leader, performed a most important work in his community. This is perhaps best exemplified in the founding and development of the Natural History Society of Maryland. This organization, and the innumerable young people who received impetus from his guidance and encouragement, will remain a monument to his memory in the years to come.

Those of us who were fortunate enough to have known him, deeply regret his passing. His like shall never come our way again.

THE ORIGIN OF INSECT WINGS

A review of some ideas concerning insect flight

by Wilfred B. Hathaway[1] Ph. D.

A student of entomology soon comes to expect the curious and even the fantastic. Nevertheless, insect flight is perhaps one of the most intriguing phenomena of the animal world. No other invertebrate group exhibits winged flight and only a few of the chordates, principally the birds and a few mammals, have wings. One of the interesting aspects of the study of insect wings is emphasized by what is probably rather trite humor but as close as one can come to levity in treating the topic at hand.

"According to the theory of aerodynamics (and as may be readily demonstrated through wind tunnel experiments) the bumblebee is *unable* to fly. This is because the size, weight and shape of his body in relation to the total wingspread make flying *impossible*. But the bumblebee, being ignorant of these scientific truths, goes ahead and flies *anyway*."

The insect holds a position on one of the top branches of the invertebrate animal tree and true to its annelid ancestry has a segmented body. The insect differs from the annelid in possessing three chief body regions, - head, thorax, and abdomen. In our discussion we are concerned with the middle area or thorax.

The thorax contains three of the twenty or so body segments. These segments, proceeding from the anterior to the posterior end of the body, are *prothorax, mesothorax,* and *metathorax* In modern insects a wing pair is attached to both the *mesothorax* and *metathorax.* In addition it is known from excellent fossil evidence that some primitive insects possessed a pair of prothoracic wings and even small abdominal wings.

All insects, however, do not possess wings. In fact, the class Insecta (Hexapoda) of the phylum Arthropoda is divided into two subclasses, the Apterygota and the Pterygota, - that is, those insects without wings and those with wings. As derived from the Greek *a* means *without* and *pteron* wing. It is true that a few members of the Pterygota lack wings but it is believed that these cases represent a retrogression from the winged state. Most entomologists believe that the Apterygota have developed from wingless forms.

The origin of insect flight has provided the basis for much speculation and a number of schools of thought have arisen. J. H. Comstock points out that the reasons for adopting a uniform system of wing venation are entirely separate from the question as to the method of insect wing development. One point of view concerning wing development has been that wings are derived from gills, - perhaps from the dorsal gills of annelid ancestors or from tracheal gills resembling those found in the nymphs of May-flies. The favored school of thought today considers the wings to have developed from lateral expansions of body segments.

[1]State Teachers College, Towson, Maryland

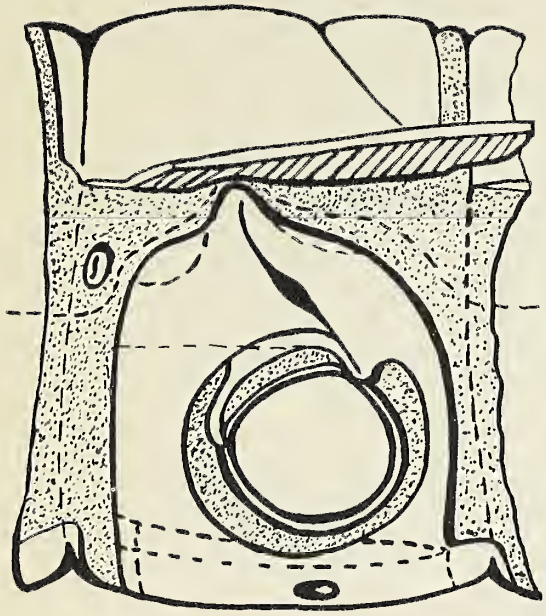


Fig. 1. Hypothetical segment of insect thorax before wing development. Side view. (after Snodgrass)

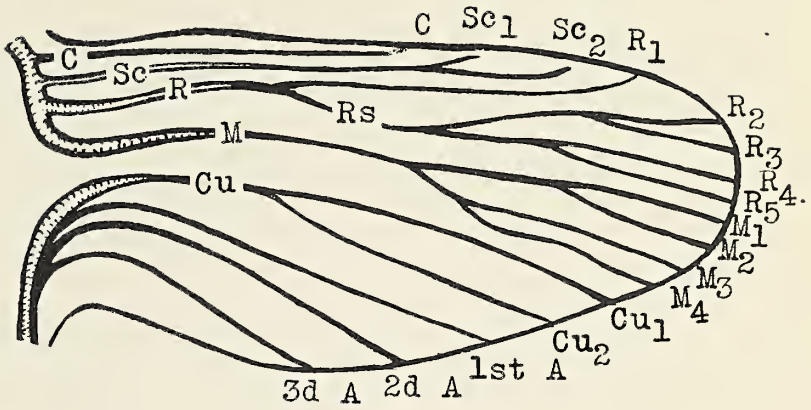
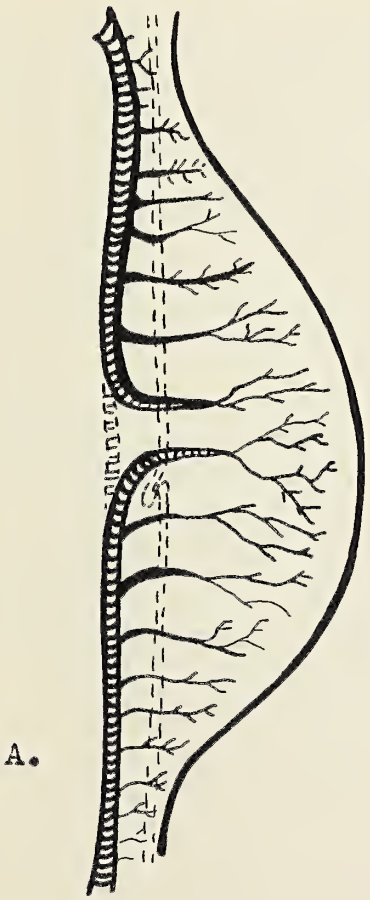
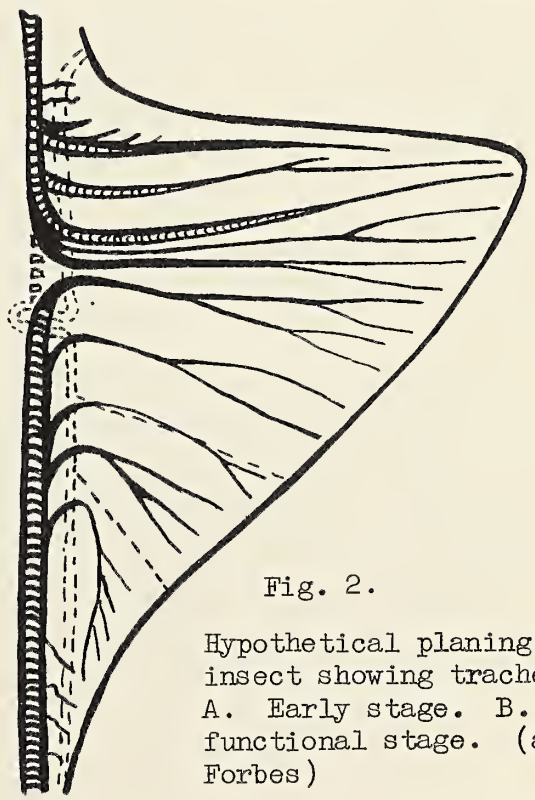


Fig. 3
Hypothetical tracheation of a wing of a primitive nymph. (after Comstock)



A.



B.

Fig. 2.

Hypothetical planing wing of insect showing tracheae. A. Early stage. B. Fully functional stage. (after Forbes)

Recall that the insect body is a rather box-like structure consisting typically of dorsal, ventral, and lateral plates on each segment. These plates are termed respectively terga, sterna and pleurae. If we accept the view that the wings are derived from extensions of the lateral edges of the terga we agree with most insect morphologists today.

See Figure 1 showing an hypothetical insect thoracic segment before the development of wings. Note that there is a flange along the entire width of the tergal plate in which both the upper and lower surfaces belong to the tergum. See also that the pleura is divided by a suture into two areas, the anterior episternum and posterior epimeron. The suture is an infolding with an internal flange ending in a knob on top that is termed a wing process. The flange of the pleural suture is assumed to support the tergal flange at a single point near the middle.

Note also in Figure 1 the tracheal trunk that runs within the flange and divides into tracheal branches. The shape of the flange could be supposed to produce a single series of longitudinal branches.

W. T. M. Forbes believes that flight developed in the following four stages:

1. leaping
2. gliding
3. steering
4. true flight

To utilize the first two stages we suppose a greatly flattened insect like a wingless cockroach with the ability to leap and plane like a flying squirrel. An examination of Figure 2 will show the supposed development. *A* shows an early stage of development. Note that in *B* there is an increase in flap length in front of the center of gravity. Such an increase would greatly assist in control of flight. A study of insect musculature makes it seem likely that muscle action would be of some slight value even at this stage if we assume that the wing chitin was somewhat flexible. Since true flight would not yet be possible, we may hypothesize that evolution would proceed along the line of increase in wing area and improvement in steering.

To improve steering we hypothesize that the wing fulcrum moved forward thereby concentrating the part of the wing controlled by the important basalar muscle. The tracheae in the leading portion of the wing enlarged and this wing portion became stronger and stiffer because of greater chitinization. To convert this kind of wing into an efficient organ of flight we then suppose a rather simple but odd process. The basalar muscle must develop a vibratory type of contraction. Since the basalar muscle is attached to the stiffened anterior portion of the wing developed for steering, any vibratory motion would produce something comparable to sculling. Actual but weak flight would result.

Later changes would include a thinning of the wing bases and the areas

between veins, the involvement of the indirect wing muscles, and the development of a hinge at the base of each wing.

The derivation of the wing veins makes a fascinating study. Although the matter is too involved to present fully in a short discussion we can understand some of the essentials. Insects breathe by means of a series of internal tubes connected to the outside through a series of paired openings or spiracles on the thorax and abdomen. The spiracles are valve-like and can open and close in response to air pressure. The internal tubes or tracheae ramify to all parts of the body. It is certain that the principal wing veins of insects are derived from tracheae. A study of insect immature stages makes clear the manner of tracheal development.

When the more generalized representatives of the various insect orders are studied it becomes apparent that all insect wings have derived from a primitive type having a common venational pattern. Wings, therefore, appear to have arisen only once in the history of insects. A basic hypothetical insect wing from which all other insect wings derive would appear as in Figure 3. A comparison with Figure 1 will indicate how the veins probably developed from the longitudinal tracheal trunks.

In conclusion, it is interesting to observe how the various forms of the insect wing have provided a prime basis for classification. The subclasses of the Insecta are separated on the basis of the absence or presence of wings. Nearly every insect order, as shown in Table 1, has wing form as a major character.

Table 1. Classification of insects

Class: Hexapoda

Subclass: Apterygota

Order: Protura (Gr.: *protos*, first; *oura*, tail) Primitive-tails	Ametabolous Development (Without Metamorphosis)
Order: Diplura (Gr.: *dis*, two; *oura*, tail) Two-pronged Bristle-tails	
Order: Thysanura (Gr.: *thysanos*, a tassel; *oura*, tail Bristle-tails	
Order: Collembola (Gr.: *colla*, glue; *embolon*, a bolt, bar) Spring-tails	

Subclass: Pterygota

Order: Orthoptera
(Gr.: *orthos*, straight; *pteron*, wing) Cockroaches, Mantes, Grasshoppers, Crickets

Order: Isoptera
(Gr.: *isos*, equal; *pteron*, wing) Termites

Order: Dermaptera
(Gr.: *derma*, skin; *pteron*, wing) Earwigs

Order: Embioptera
(Gr.: *embios*, lively; *pteron*, wing) Embiids

Order: Corrodentia
(L.: *corrodens*, gnawing) Psocids (Book Lice, etc.)

Order: Zoraptera
(Gr.: *zoros*, pure; *apterous*, without wings) Zorapterons

Order: Thysanoptera
(Gr.: *thysanos*, fringe; *pteron*, wing) Thrips

Paurometabolous Development (Gradual Metamorphosis)

Order: Ephemeroptera
(Gr.: *ephemeros*, lasting but a day; *pteron*, wing) Mayflies

Order: Odonata
(Gr.: *odous*, a tooth) Dragonflies, Damselflies

Order: Plecoptera
(Gr.: *plekos*, plaited; *pteron*, wing) Stoneflies

Hemimetabolous Development (Incomplete Metamorphosis)

Order: Anoplura
(Gr.: *anoplos*, unarmed; *oura* tail) Biting Lice, Sucking Lice

Order: Hemiptera
(Gr.: *hemi*, half; *pteron*, wing) Bugs

Paurometabolous Development (Gradual Metamorphosis)

Order: Neuroptera
(Gr.: *neuron*, nerve; *pteron*, wing) Dobson Flies, Fish Flies, Lace Wings

Order: Mecoptera
(Gr.: *mekos*, length; *pteron*, wing) Scorpion Flies

Order: Trichoptera
(Gr.: *trichos*, hair; *pteron*, wing) Caddis Flies

Order: Lepidoptera
(Gr.: *lepido*, scale; *pteron*, wing) Butterflies, Moths

Order: Coleoptera
(Gr.: *coleos*, sheath; *pteron*, wing) Beetles

Order: Strepsiptera
(Gr.: *strepsis*, turning; *pteron*, wing) Stylopids

Order: Diptera
(Gr.: *dis*, two; *pteron* wing) Flies

Order: Siphonaptera
(Gr.: *siphon*, a tube; *apteros*, without wings) Fleas

Order: Hymenoptera
(Gr.: *hymen*, membrane; *pteron*, wing) Wasps, Ants, Bees, Sawflies, Ichneumon Flies

Holometabolous Development (Complete Metamorphosis)

References

1. Comstock, J. H.
1918. The wings of insects.
The Comstock Publishing
Company, Ithaca, N. Y

2. Forbes, W. T. M.
1943. The origin of wings and
venational types in
insects.
The American Midland
Naturalist. 29: 381-405.

3. Snodgrass, R. E.
1935. Principles of insect morphology.
McGraw-Hill Book Company
New York, N. Y.

Appreciation is expressed to Brian W. McMullin for the preparation of the figures.

AN INTERESTING NEST

On November 26, 1949, while the writer was leading a bird trip around Loch Raven, Baltimore Co., Mr. Herbert Strack collected a rather interesting vireo nest. The collector was surprised to find that the nest still contained a vireo egg half buried in the bottom.

Later when I examined the nest more closely I found that there was another egg much more deeply buried in the bottom; this second egg was plainly that of a cowbird *(Molathrus ater)*. It is well known that the yellow warbler will react to the appearance of the "parasitic" cowbird's egg in its nest by building a new nest above the old. Friedmann (The Cowbirds; p. 235) says, "Occasionally the (red-eyed) vireo covers over, or buries (under a new nest floor), the parasitic eggs as does the Yellow Warbler, but on the other hand it has been known to incubate Cowbird's eggs even when none of its own were present, and almost always seems not to mind the strange eggs in the least."

At the time we examined the nest we thought it to be that of a white-eyed vireo *(Vireo griseus)* rather than that of the red-eyed vireo *(Vireo olivaceus)*. For the former species Friedmann makes no mention of the egg-burying habitat. Unfortunately, the nest has been mislaid and its identity cannot now be checked.

Haven Kolb

THE RAVINE SALAMANDER IN MARYLAND

by C. J. Stine[1] and J. A. Fowler[2]

A Ravine Salamander, *P. richmondi*, from Ritter Park, Cabell Co., West Virginia. Actual size 4 3/4 in.

The inclusion of the ravine salamander, *Plethodon richmondi* Netting and Mittleman, in the herpetofauna of Maryland is based on a single specimen in the Carnegie Museum (CM 12928) and six specimens in the University of Maryland collection [514 (6)].

According to the description of Netting and Mittleman (1938) the Carnegie Museum specimen is typical, being 4.5 inches in length with 21 costal grooves, counting two that are joined just in front of the hind legs. It was collected by Mr. Leonard Llewellyn on June 6, 1937, from beneath a decaying log adjacent to a small branch of Moores Run on the edge of a valley field. The locality is 3.75 mi. south of East Lonaconing in Allegany County. Duellman (1954) has found the habitat preference in southwestern Ohio to be under rocks on wooded slopes, less commonly under logs and bark. Netting and Mittleman (1938) state that this salamander "exhibits a marked preference for the slopes of valleys and ravines, never occurring on hill tops and only rarely on the valley floor". Thus the habitat of the Carnegie Museum specimen may be considered somewhat atypical.

Physiographically the Carnegie specimen was collected on the eastern edge of the Allegheny Plateau near the western face of the Allegheny Front, Dans Mountain (Fenneman, 1938). This species also occurs on the Allegheny Plateau

[1] Natural History Society of Maryland

[2] Director of Education, Academy of Natural Sciences of Philadelphia

in Pennsylvania and in West Virginia (Wilson and Friddle, 1950).

The six University of Maryland specimens were recently brought to the attention of the senior author by Dr. Richard Highton. They had been originally misidentified as lead-backed salamanders, *Plethodon cinereus cinereus*. They were collected by W. F. Keller on May 11, 1945 at an old sawmill. The locality was 2.5 miles north of Cumberland on the Bedford Road in Allegany County.

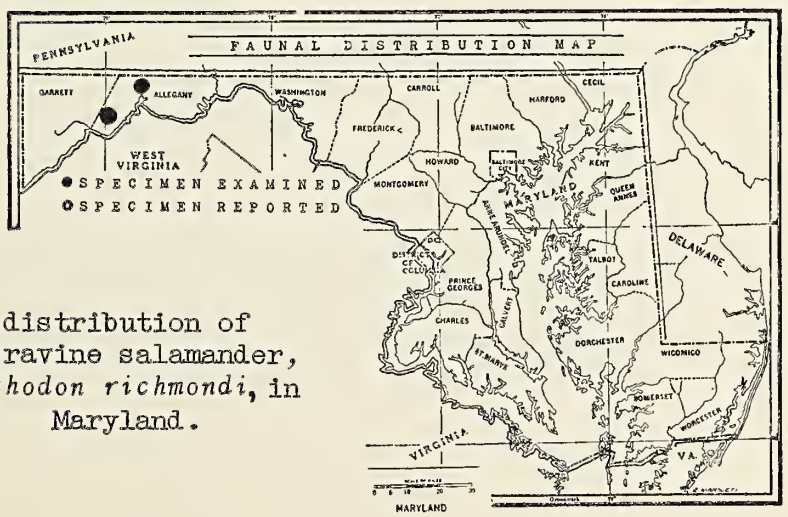
Physiographically these specimens were collected on the western edge of the Valley and Ridge Province. The nearest Pennsylvania locality is 1.5 miles east of Mann's Choice in Bedford County, also in the Valley and Ridge.

Bishop (1947) indicates in his distribution map of *P. richmondi* that it extends eastward in the Valley and Ridge Province as far as Washington County. We are presently unaware of any records justifying this extension. It is hoped that this note will result in intense investigation of this form in Maryland to better define its distributional limits in the State.

The distinguishing features of *P. richmondi* and *P. c. cinereus* are listed herewith to facilitate differential diagnosis between the two species which are often confused.

P. richmondi	*P. c. cinereus* (lead phase)
Costal grooves 19 - 22	Costal grooves 17 - 20
Comparatively longer trunk than *P. c. cinereus*	Shorter trunk than *P. richmondi*
Uniformly dark throat and venter	Mottled "salt-and-pepper" effect of throat and venter
Found most commonly on valley slopes, rarely on valley floors and not on hilltops	Found commonly on hilltops as well as slopes and valley floors

The authors would like to express their thanks to Mr. Leonard Llewellyn, Mr. Neil D. Richmond and Dr. Richard Highton for generously supplying information regarding these records.



The distribution of the ravine salamander, *Plethodon richmondi*, in Maryland.

LITERATURE CITED

Bishop, Sherman C.
1947. Handbook of salamanders. Comstock Publishing Co., N.Y.: Map 30.

Duellman, William E.
1954. The salamander *Plethodon richmondi* in Southwestern Ohio. Copeia (1): 40-5.

Fenneman, Nevin M.
1938. Physiography of eastern United States. McGraw Hill Book Co., N. Y.: Pl. II.

Keller, William F.
1954. Notes on Maryland salamanders. Copeia (4): 233

Netting, M. Graham and Myron B. Mittleman.
1938. Description of *Plethodon richmondi*, a new salamander from West Virginia and Ohio. Ann. Carnegie Mus., 27 (18): 287-93, Pl. XXX.

Wilson, L. Wayne and Saufley B. Friddle.
1950. The herpetology of Hardy County, West Virginia. Amer. Midl. Nat., 43, 1: 165-172.

EARLY ARRIVAL OF LEAST BITTERN AT BALTIMORE

Weather during the first half of March 1956 was quite normal in the Baltimore region with daily maximum temperatures in the fifties (Fahrenheit) and daily minima near or below freezing. The maximum recorded in this period was 71°F. on March 5. On March 16, however, temperatures lowered and mixed rain, sleet and snow set in, continuing the next day and culminating in a blanket of 5 inches of snow on March 18. Temperatures for the three days were: March 16: 39° max., 27° min.; March 17: 36° max., 25°min.; March 18: 32° Max., 26° min.

On March 18 there was brought to the Baltimore Zoo by an anonymous donor a weak but living specimen of the least bittern *(Ixobrychus exilis)* which had been picked up on a Baltimore street, grounded and confused by the snow storm. Attempts by the zoo's headkeeper of birds and reptiles, Mr. Frank Groves, to feed and strengthen the bird were unavailing and when it died, Mr. Groves, a member of the Natural History Society of Maryland, presented the specimen for our collection.

This specimen is of considerable interest. Not only is it an illustration of the effect spring storms may have in confusing migratory birds and grounding them in unusual habitats but it seems to represent an unusually early date for the species in Maryland. The earliest published dates of arrival which I can find are much later. At Washington, April 27 is the earliest date given by Cooke *(Proc. Biol. Soc. Washington,* 42: 24, 1929). The resume of weather conditions in early March given above indicates that there was no great stimulation to migration preceding the mid-March storm. The nearest part of the normal wintering range of the species is in Georgia. It seems, therefore, impossible to give any satisfactory hypothesis concerning the advent of this bird. It would seem to be best to allow it to stand as an indication of the possibilities for geographical displacement inherent in a winged creature, even one so poorly equipped for aerial navigation as the least bittern.

Haven Kolb

CORKY WINGS OF THE SWEET GUM

by Irving L. Towers

In conducting a close study of practically any plant the observer soon becomes convinced that he is dealing with an adroit, resourceful organism capable of both intricate and devious activities to gain its ends. As a matter of fact it is not always too easy to follow the plant's lead even when the clues are obvious and the literature assiduously points the way.

The example under consideration presently is a tree whose optimum habitat is the swamp, the swale or the river's flood-plain. In consequence thereof it is required to make a special effort to obtain sufficient oxygen to satisfy its inner, protoplasmic tissues. The root, individually, is apparently unable to carry this burden. The stem must, accordingly, seek elsewhere for an additional supply. In so doing it takes cognizance of the fact that while there is an inner deficiency, the leaves are, at one and the same time, actually giving off oxygen into the air. In order to turn this situation to its advantage the plant has devised a trap for the apprehension or recapture of at least a portion of this byproduct of the process of food manufacture.

The Sweet Gum *(Liquidambar styraciflua)* is sometimes called "the tree with wings" due to the conspicuous corky projections on its smaller branches and twigs. It is also known as "Alligator-wood" because on small vertical stems these appendages are conical to simulate the saurian's back. In its more southerly range, an exudate known as liquid-amber is obtained when the trunk is tapped; among other uses it is employed in tobacco flavoring and in cosmetics. As an article of commerce the reddish-brown heartwood is known as Red Gum and is marketed separately from the light sapwood called Sap Gum.

In order to interpret the significance of the corky wings as depicted in the drawing it is essential to first grasp the value, to the plant, of the middle lamella. These wings serve only as a housing for the pink, oxygen-absorbing threads which are but extensions of the middle lamella.

The middle lamella is a comparatively thin sheet of reddish, living tissue interpolated everywhere throughout both woody and corky structures. Since the main function of the tree's trunk is the support of a prodigious weight, this comparatively frail, protoplasmic material must of necessity be sparingly distributed. Its function is to service the supporting tissues and to add to their strengthening material as the burden increases. It is apparent that in the Persimmon *(Diospyros virginiana)* the middle lamella lies dormant in the center of the trunk for approximately a century before even starting to build the heartwood. On the other hand, the Black Locust *(Robinia pseudo-acacia)* waits only until its third year to reactivate its middle lamella.

Oxygen is, to the middle lamella, as much of a necessity as it is to most living tissues and when there is a deficiency the lamella takes steps to rectify the situation by extending threads for the direct absorption of this vital element. These protoplasmic threads function in a medium of either air or water,

requiring only the sanctuary afforded by the cell-cavity.

We have read (*Towers*, 1953, *Maryland Naturalist*, Vol. 23, Nos. 3 and 4, 85-90) that the middle lamella of the Cypress root extends microscopic threads across the channels of the water-conductors to intercept the minute bubbles of oxygen present in the water. The lamella-thread is able to do this because of its high content of iron, giving it an affinity for oxygen and coloring it varying shades of red.

The root of the Sweet Gum has quite similar lamella-threads, but here we find them traversing the larger vessels which are lacking in the Cypress. The net result, however, is that by the time the water is drawn up the Sweet Gum's stem, the oxygen content is so depleted that the middle lamella must make provisions for its replenishment. It does this by forming the corky wings for the purpose of housing practically the same type of interceptor as is used in the root, except that here in the wing, the threads absorb oxygen from the air instead of from the water.

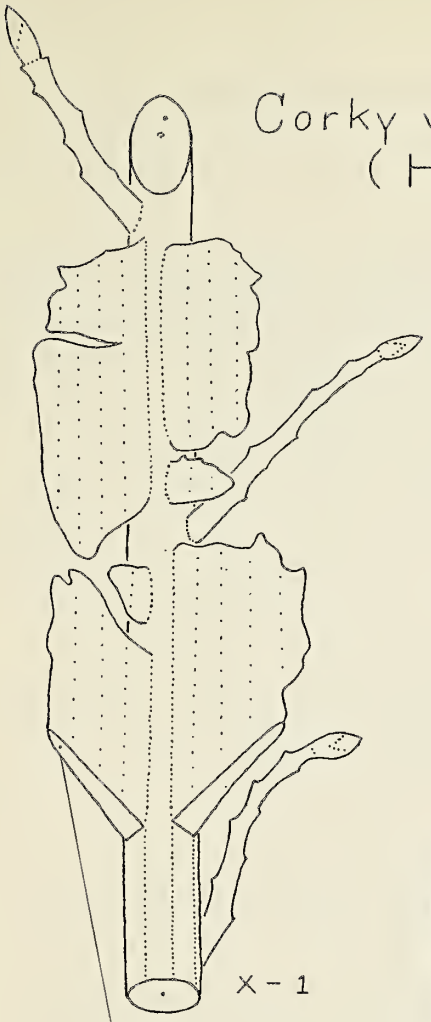
The corky wings are spread so as to form a trough, ordinarily several inches in length, to catch and retain the comparatively heavy oxygen given off by the leaves. The walls of the cork-cells are provided with adjustable, ventilating valves or stomata to prevent a drastic drying out of the lamella-threads and also for the exclusion of the elements.

Upon comparing commercial cork with this material it appears probable that the Cork Oak *(Quercus suber*, etc.) employs its cork in a somewhat modified respiratory capacity. The relatively open construction of virgin cork allows adequate aeration. Subsequent strippings also display a good percentage of this less valuable material. A radial section, cut to a single unit in thickness, showed a smaller type cell, oblong in outline with prominent, bright red lamella-threads. The stomata are notably smaller, more highly developed and appear tightly closed. The corky wing, on the other hand, soon loses most of its buoyancy when floated on water. The restricted range of the cork-vestured, evergreen tree of the Mediterranean area would seem to place an emphasis on its atmospheric requirements. The Sweet Gum has a less specialized cork and possibly a wider range.

Dr. Faubel (1941, *Cork and the American Cork Industry)* states that the hot, desert winds frequently blow for days in the semi-arid region of the Cork Oak. We know this factor to be extremely deleterious to most vegetation. The great affinity hydrogen has for oxygen is also a well known fact. The tree's deep vesture of cork obviously provides a huge surplus of oxygen which, by weight, makes up about nine-tenths of water's composition. The surplus oxygen could readily be transferred, via the middle lamella, to the leaves where the synthesis of water would entail a comparatively simple procedure. We might conclude from these two instances that perhaps cork may be gainfully employed upon occasions of either an excess or a deficiency of moisture.

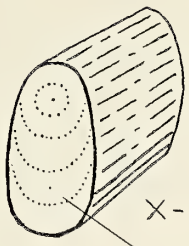
Foresters find that the Sweet Gum attains a height of from sixty, to one hundred and forty feet with a trunk diameter of from two, to five feet. The lumber has desirable features as a finishing material and, being in good supply, it has long been the basic stock of the extensive Southern furniture manufacturing industry.

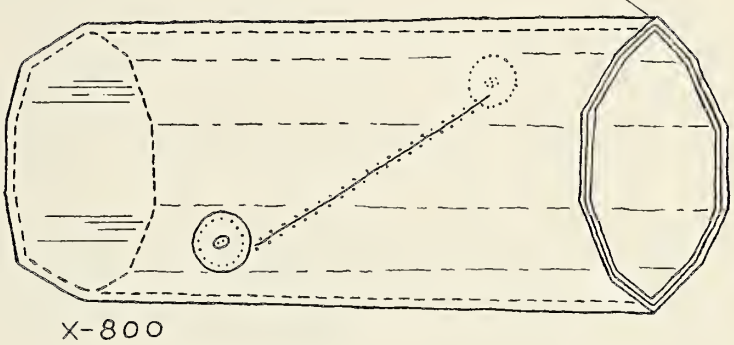
For additional information see: Harriet L. Keeler, *Our Native Trees* (1900); and, Peattie, *A Natural History of Trees of Eastern and Central North America.* (1950).



Corky wings of 6-yr., old branch.
(Horizontal in life).

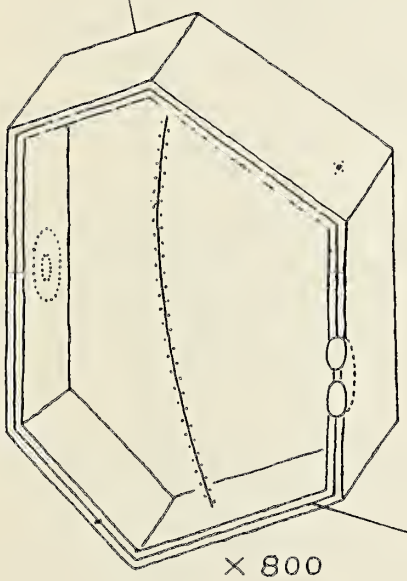
Shallow, storage root.





Lamella-thread crossing bore of vessel between bordered-pits.

Cork-cell with stomata.



middle lamella

Sweet Gum or Red Gum.

Liquidambar styraciflua L.

AN ANNOTATED LIST OF THE AMPHIBIANS AND REPTILES OF ANNE ARUNDEL COUNTY, MARYLAND

by John E. Cooper[1]

The following county list is based on observations and collections made by the writer intermittently over the last seven years. Anne Arundel County is contained in the physiographic region of Maryland known as the western or inner Coastal Plain and its fauna is typical of southern Maryland's western shore. The county is bounded on the east by the Chesapeake Bay, on the south by Calvert County (political boundary), on the west by the Patuxent River and Prince George's County, on the northwest by parts of Howard and Baltimore Counties (political boundaries), and on the northeast by the Patapsco River.

Nearly all of the specimens recorded here are contained in the collection of the Natural History Society of Maryland (NHSM). Some are in the United States National Museum collection (USNM), and the private collection of Mr. M. F. Groves (MFG). References to Mansueti are to his 1941 publication (A descriptive catalogue of the amphibians and reptiles found in and around Baltimore City, Maryland, within a radius of twenty miles. *Pro. Nat. His. Soc. Md.* No. 7 iii, 53 p. Mimeo.). The writer felt that any further reference to the reptile records in McCauley (1945, *The Reptiles of Maryland and the District of Columbia.* Pub. by author. 194 p., pls. & maps) would be unnecessary.

The writer wishes to express his appreciation to Dr. Romeo Mansueti, Chesapeake Biological Laboratory, Solomons, Maryland, for his interest and guidance in this project, to Mr. M. F. Groves, Head keeper of Reptiles, Baltimore Zoo, for use of his collection which he has subsequently donated to the Natural History Society of Maryland, and to Dr. Doris M. Cochran, United States National Museum, Washington, D. C., for her aid in obtaining the Museum's county amphibian list. Mr. J. Fulton Lewis and other residents of Briarcliff-On-The-Severn, a community on the Severn River near Joyce Lane, collected and supplied interesting specimens which would otherwise have escaped notice; Drs. R. S. Simmons and C. J. Stine did the same.

SPECIES LIST

1. *Diemictylus viridescens viridescens* Rafinesque. Newt. Commonly observed throughout the county in April and May of several years. Very abundant in small, deep, algae-filled transient ponds in commercial sand-gravel pits just north of Priest's Bridge (hereafter called sand-gravel pits) on May 17, 1947. Craine and Defense Highways (NHSM-A683); Priest's Bridge (NHSM-A778, 1661-62, 1927-29, 2083); Crownsville (Mansueti).

2. *Ambystoma maculatum* Shaw. Spotted salamander. Seasonally abundant in woodland breeding ponds in other southern counties, but few specimens available from Anne Arundel. Harwood (USNM 103740).

3. *Ambystoma opacum* Gravenhorst. Marbled salamander. Over a dozen specimens are available from the county, all from the Priest's Bridge area. All were taken in April and May from under cover of logs or boards. Priest's Bridge (NHSM-A864-65, 1838-39, 1926); nr. Priest's Bridge (MFG-A14).

[1]Curator of Herpetology, Natural History Society of Maryland

4. *Desmognathus fuscus fuscus* Rafinesque. Dusky salamander. This species in Anne Arundel County, as in other Coastal Plain counties in Maryland, is relatively uncommon. Shore Acres, Severn, Crownsville (all Mansueti).

5. *Plethoden cinereus cinereus* Green. Red-backed salamander. Found regularly throughout the county in spring and summer. Both phases encountered under cover in moist deciduous woods. Furnace Branch (NHSM-A264); Briarcliff (NHSM-A866-67); Priest's Bridge (NHSM-A1663), (MFG-A9); nr. intersection Defense Highway and North River (MFG-A3); Friendship.

6. *Hemidactylium scutatum* Schlegel. Four-toed salamander. Considered uncommon because of its secretive habits. Found in number in late April, 1948 in small sphagnum-filled ponds bordering the woodlands at the sand-gravel pits. Females with eggs in nest sites were found under sphagnum on the edge of a pond on route 50 west between the Cape St. Claire road and route 2 on April 16, 1954. Briarcliff (NHSM-A1974); Priest's Bridge swamp.

7. *Pseudotriton montanus montanus* Baird. Baird's red salamander. Commonly found under cover in and around the transient ponds in the sand-gravel pits. Cromwell's Woods (NHSM-A600); sand-gravel pits (NHSM-A1660, 1667-69, 1689); 13 mis. N. of Upper Marlboro (NHSM-A2472); Priest's Bridge (USNM 101427-28).

8. *Pseudotriton ruber ruber* Sonnini. Eastern red salamander. Collected in the sand-gravel pits in company with *montanus*. Cromwell's Woods (NHSM-A168); Glen Burnie (NHSM-A728); sand-gravel pits (NHSM-A1635); Priest's Bridge (USNM 101426), (MFG-A12); Furnace Creek, Sawmill Creek (both Mansueti).

9. *Eurycea bislineata bislineata* Green. Two-lined salamander. Found in a swift stream at North River near the Defense Highway (NHSM-A1426). Also taken from a stream near the sand-gravel pits. As with *fuscus* this form is less abundant in the Coastal Plain than in the Piedmont of Maryland.

10. *Scaphiopus holbrooki holbrooki* Harlan. Spadefoot toad. Recorded from the sand-gravel pits; Briarcliff (NHSM-A1782); near Joyce Lane (NHSM-A2003); and W. Owings, Edgewater, and nr. Annapolis (Reed, 1956, *Herpetologica*, 12:294-95). The single specimen from Briarcliff was dug from a garden on April 20, 1947. Very heavy rains on several warm nights preceded breeding choruses of this species at the sand-gravel pits in the spring of 1947. Innumerable DOR specimens were found on U. S. route 301 approx. 10 mi. S. of Glen Burnie near Benfield on June 23, 1950. Again, very heavy rains accompanied this appearance. A resident of the area mentioned that she had heard peculiar noises, "like babies crying," throughout the night of June 22. She described the noise as "deafening." Stine, Simmons, and Fowler (1956, *Herpetologica*, 12:295-96) list the following records: sand-gravel pits (eggs, tadpoles, and toadlets on June 29, 1947), (breeding colonies during hurricane rains on August 12, 1955); Benfield (breeding Colony in transient roadside pond during hurricane rains on August 12, 1955); Glen Burnie(same situation as preceding); and Annapolis (recently transformed toadlets on lawn, September 3, 1955).

11. *Bufo terrestris americanus* Holbrook. American toad. Individuals have been taken from North River (NHSM-A1031), Priest's Bridge (NHSM-A1659, 1934),

and the sand-gravel pits. Less common than *Bufo woodhousi fowleri*. Crownsville (Mansueti).

12. *Bufo woodhousi fowleri* Hinckley. Fowler's toad. Abundantly distributed throughout the county; especially plentiful at the sand-gravel pits and in other sandy regions, where groups of as many as 15 individuals have been found under cover during hot days. Furnace Branch (NHSM-A265); Millersville (NHSM-A671); Shore Acres (NHSM-A762); Priest's Bridge (NHSM-A858,861,863); sand-gravel pits (NHSM-A1116-18, 1643, 1654-57, 1671, 1687, 1691-95, 2004-07, 2089-90, 2098); near Magovista (NHSM-A 2653); Bay Ridge (USNM 26170); nr. Gibson's Island; route 50 west nr. Sandy Point.

13. *Acris gryllus crepitans* Baird. Cricket frog. Found throughout the county, at permanent and transient fresh-water sites, during late spring. Very abundant in the sand-gravel pits. Millersville (NHSM-A672-79); Priest's Bridge (NHSM-A859-60, 1316-21, 1627-31); sand-gravel pits (NHSM-A1673, 2091-92, 2096); Mt. Carmel pond (NHSM-A1311-15); North River (NHSM-A1427); 13 mis N. of Upper Marlboro (NHSM-A2457-58, 2463-64); Stoney Run (NHSM-A2738); Patuxent River (USNM 101222); nr. intersection Defense Hgwy. and North River (MFG-A4); Pinehurst; Linthicum; route 50 west nr. Sandy Point; Crownsville, Linstead (both Mansueti).

14. *Pseudacris nigrita feriarum* Baird. Swamp chorus frog. Widespread. Found in conjunction with *Hyla c. crucifer* in the spring. Priest's Bridge (NHSM-A954, 1696); North River.

15. *Hyla cinerea cinerea* Schneider. Green tree frog. Known from Mill Creek; near Briarcliff (NHSM-A1680); and $2\frac{1}{2}$ mis. N. of Joyce Lane DOR on U. S. route 2 (NHSM-A1688). The specimen from near Briarcliff was found among vegetation at an old building site more than half a mile from any visible water. Residents of Briarcliff (a community directly on the Severn River) describe a *cinerea*-like call which emanates from nearby marshes. To date, however, no specimens have been obtained. The species probably breeds in river marshes throughout the southern part of the county.

The taxonomic status of Anne Arundel County populations is at present considered to be intermediate between *cinerea* and *evittata*, since no precise study has appeared which would date Dunn's 1937 paper (Emett Reid Dunn, 1937, *Proc. Biol. Soc. Wash.*, 50: 9-10). Such a study has been undertaken by Drs. C. J. Stine and R. S. Simmons of Baltimore.

16. *Hyla crucifer crucifer* Wied. Spring peeper. Abundant during the early spring throughout the county in swampy regions such as North River and Priest's Bridge. Occasional specimens found during summer in logs and under stones and other cover. Priest's Bridge (NHSM-A952-53, 1633-34, 1672, 1930, 1932, 1997-99); North River (NHSM-A1423-25, 1931); Magovista (NHSM-A2087); nr. Pinehurst.

17. *Hyla versicolor versicolor* Le Conte. Gray tree frog. Breeds in the transient ponds of the sand-gravel pits during May. Recently transformed young, 6 mm. long, found in number in early June. Sand-gravel pits (NHSM-A 1028), (USNM 101429-32); Magovista (NHSM-A2086); Briarcliff.

18. *Rana catesbeiana* Shaw. Bullfrog. Found in nearly every fair-sized body of fresh water in the county. Notably abundant in the swamp and large ponds at and near Priest's Bridge and the sand-gravel pits, in the Severn River marsh at Briarcliff, and at Severna Park. Tadpoles were found in the Mt. Carmel pond. Priest's Bridge (NHSM-A1658); Linthicum.

19. *Rana clamitans* Latreille. Green Frog. An abundant species, recorded from all sectors of the county. Crownsville (NHSM-A169); Furnace Branch (NHSM-A263, 266, 291); Priest's Bridge (NHSM-A862, 1235-36, 1625, 1664, 1686, 1996), (USNM 101433); Briarcliff (NHSM-A1152); Joyce Lane (NHSM-A1179); North River (NHSM-A1422, 1933); Fort Smallwood (NHSM-A1840); 3 mis. S. of Glen Burnie nr. Crains Highway.

20. *Rana palustris* Le Conte. Pickerel Frog. Recorded from: Priest's Bridge (NHSM-A1227-28, 1626, 1665, 1691, 2097); North River (NHSM-A1577); Linthicum; nr. Furnace Creek; Shore Acres; Glen Burnie.

21. *Rana pipiens pipiens* Schreber. Leopard frog. Like *clamitans*, the leopard frog is commonly encountered. In roadside puddles near Arnold *pipiens* was found along with *Acris gryllus crepitans* and *Rana clamitans*. Several individuals were found aestivating in a log in the sand-gravel pits in August, 1948. The species breeds in the transient ponds at this locality. Annapolis (NHSM-A802); sand-gravel pits (NHSM-A1114-15, 1149-50); Priest's Bridge (NHSM-A1644, 1666, 1670, 1685, 1690, 1995); Mt. Carmel pond (NHSM-A1225); Glen Burnie (NHSM-A1855-57); Magovista (NHSM-A2008); Severn Run at Dicus Mill Rd. and Craine Highway; Linthicum.

22. *Rana sylvatica sylvatica* Le Conte. Wood Frog. On the afternoon of March 16, 1947, hundreds of specimens were found breeding in the fresh-water swamp at North River, along with *Hyla c. crucifer*. The rear portion of the swamp was covered with ice two-inches thick. Newly transformed young were found in the transient ponds of the sand-gravel pits in May. Priest's Bridge (NHSM-A1151, 2008); North River (NHSM-A1419-21).

23. *Chelydra serpentina serpentina* Linnaeus. Snapping turtle. An abundant species, found in all the larger bodies of water, swamps, and marshes. Recorded from: Lake Shore (NHSM-R774); Shore Acres; Briarcliff; Joyce Lane; Priest's Bridge; North River.

24. *Sternotherus odoratus* Latreille. Musk turtle. Infrequently encountered; found in but a few localities. Priest's Bridge (NHSM-R255, 830, 890); North River (NHSM-R865, 986); Wagner's Pond, 1½ mis N.E. of Glen Burnie; Balto.-Wash. Expressway at Patapsco River.

25. *Kinosternon subrubrum subrubrum* Lacepede. Mud turtle. Abundant, especially in the inlet marshes of the Severn and North Rivers and in the Priest's Bridge swamp. Has been found in the transient ponds of the sand-gravel pits. Shore Acres (NHSM-R252); Annapolis (NHSM-R256); Priest's Bridge (NHSM-R257, 592, 849, 1056); Briarcliff (NHSM-R850, 852-53, 1057-58); Cromwell's Woods.

26. *Clemmys guttata* Schneider. Spotted turtle. Common in swampy regions. Glenburnie (NHSM-R280); Mt. Carmel pond; Priest's Bridge; Severna Park; Crownsville; Lake Shore; nr. Harmans.

27. *Terrapene carolina carolina* Linnaeus. Box turtle. This is probably the most abundant turtle in the county. As many as 30 individuals have been observed DOR in a short stretch of U.S. route 2 near Arnold. Glen Burnie (NHSM-R111); Briarcliff (NHSM-R520, 613); Priest's Bridge (NHSM-R863).

28. *Chrysemys picta picta* Schneider. Painted turtle. Very abundant in ponds throughout the county. Priest's Bridge (NHSM-R254, 834, 887, 1042); Mt. Carmel pond (NHSM-R1041); Alpine Beach (NHSM-R1593); North Linthicum; Balto.-Wash. Expressway at Patapsco River.

29. *Sceloporus undulatus hyacinthinus* Green. Eastern fence swift. Extremely common in the county, especially where pine associations predominate. Linstead (MFG-R45), (NHSM-R59, 64); Crownsville (NHSM-R43, 47, 145, 477): Green Haven (NHSM-R141); Shore Acres (NHSM-R204); Priest's Bridge (NSHM-R506, 876-78, 939); Briarcliff (NSHM-R519); North River (NHSM-R632, 803): Sawmill Creek (NHSM-R708); sand-gravel pits (NHSM-R908); Furnace Branch.

30. *Cnemidophorus sexlineatus* Linnaeus. Six-lined racerunner. Another extremely abundant lizard, frequenting sandy stretches such as beaches, sandy fields, and sand pits. Reaches its northernmost Maryland limit at Fort Smallwood (NHSM-R389). Furnace Branch (MFG-R41) (NHSM-R247-48); 1½ mis. N. Glen Burnie (MFG-R76); Linstead (NHSM-R69); Indian Landing (NHSM-R103); Glen Burnie (NHSM-R705-07, 112); Green Haven (NHSM-R154); Priest's Bridge (NHSM-R889); nr. Friendship.

31. *Lygosoma laterale* Say. Ground skink. Probably more widespread than records indicate. Known only from North River. First observed here in dead leaves in July, 1946; initial specimen (NHSM-R904) taken by M. F. Groves at same locality on September 11, 1946.

32. *Eumeces fasciatus* Linnaeus. Five-lined skink. Frequents wooded areas where it is abundantly found under the bark of fallen logs, in and under rotting stumps, and under other forms of cover. Not infrequently found in the open on logs and trees, or devouring insects among leaves. Linstead (MFG-R3, 17), (NHSM-R82); Briarcliff (NHSM-R514-18, 695, 831, 833, 835, 888, 909-910); Arnold (NHSM-R709-10); Priest's Bridge (NHSM-R841, 856, 1191-93); sand-gravel pits (NHSM-R907); nr. Furnace Branch; Cromwell's Woods.

33. *Eumeces laticeps* Schneider. Greater five-lined skink. Abundantly found in certain specific localities. A large colony lives on a slope of southern exposure near the intersection of the Defense Hgwy. and North River. Individuals have been collected and observed under cover on the ground, in the open on the ground, and high in trees. Nr. intersection Defense Hgwy. and North River (MFG-R88), (NHSM-R645); Joyce Lane (NHSM-R936); Shore Acres (NHSM-R1); Indian Landing (NHSM-R100); Briarcliff; Lake Shore; Severna Park; Linstead.

34. *Natrix septemvittata* Say. Queen snake. Uncommon. Cromwell's Woods (MFG-R37); Sawmill Creek; Severna Park; Annapolis Reservoir; Furnace Creek; nr. Glen Burnie.

35. *Natrix sipedon sipedon* Linnaeus. Common water snake. Found abundantly in nearly every permanent body of water in the county and occasionally in the transient ponds of the sand-gravel pits. Linstead (MFG-R67); Indian Landing (NHSM-R116); Priest's Bridge (NHSM-R253, 505, 773, 870, 1165); Briarcliff (NHSM-R510, 869); Arnold (NHSM-R1315); Camp Whippoorwill GSA (NHSM-R1410-12); Alpine Beach (NHSM-R1600); Cromwell's Woods; Fort Smallwood; Wagner's Pond, $1\frac{1}{2}$ mis. N. Glen Burnie; Furnace Branch.

36. *Storeria dekayi dekayi* Holbrook. DeKay's snake. Commonly found under cover, very often with *Haldea valeriae valeriae*. Nr. Priest's Bridge (MFG-R89); Priest's Bridge (MFG-R95), (NHSM-R891,896); Shore Acres (NHSM-R242); Joyce Lane (NHSM-R724); Briarcliff (NHSM-R845); Arnold (NHSM-R1309); Linstead; Pines.

37. *Storeria occipitomaculata occipitomaculata* Storer. Red-bellied snake. Uncommon. Known only from the sand-gravel pits and the intersection of Defense Highway and North River.

38. *Thamnophis sauritus sauritus* Linnaeus. Ribbon snake. Uncommon. Recorded from Severna Park and Furnace Creek only.

39. *Thamnophis sirtalis sirtalis* Linnaeus. Garter snake. Found abundantly along permanent bodies of water. Numerous individuals observed DOR along the swampy areas at Priest's Bridge on U. S. route 301. Annapolis (NHSM-R700); Briarcliff (NHSM-R846); Cromwell's Woods.

40. *Haldea valeriae valeriae* Baird and Girard. Ground snake. Commonly found under cover at Briarcliff (NHSM-R679, 836, 839-40, 851, 1082) and Priest's Bridge. Recorded also from Marley Creek, and Severna Park.

41. *Heterodon platyrhinos platyrhinos* Latreille. Hog-nosed snake. Infrequently found. Usually encountered in open, sandy areas. Green Haven (NSHM-R124); Shore Acres (NHSM-R1032); Glen Burnie (NHSM-R1087)· Fairview; Fort Smallwood; Friendship; Furnace Creek; Indian Landing; Lake Shore: Linstead; Linthicum Heights; Linthicum; 1 mi. E. of Glen Burnie; Magothy River; Severna Park.

42. *Diadophis punctatus edwardsi* Merrem. Ring-necked snake. Frequently taken; usually found under cover, often in gardens and near homes. $\frac{1}{4}$ mi. N. E. of Priest's Bridge (MFG-R83,84); Priest's Bridge (NHSM-R646, 717); Briarcliff (NHSM-R614); Joyce Lane (NHSM-R722); Arnold (NHSM-R723); Linstead; English Consul.

43. *Carphophis amoenus amoenus* Say. Worm snake. Found in large number at every locality visited. One specimen was found by Mr. J. Fulton Lewis crawling on his lawn at Briarcliff in the afternoon; all others were taken from under cover. $\frac{1}{2}$ mi. N. W. of Briarcliff (MFG-R80); Priest's Bridge (MFG-R90, 92), (NHSM-R871-72, 874, 900, 905-06); Linstead (MFG-R44); Crownsville (NHSM-R71); Shore Acres (NHSM-R 84); Glen Burnie (NHSM-R110); Furnace Creek (NHSM-R138-39); Arnold (NHSM-R1285-89); Briarcliff (NHSM-R511-12, 537, 615-16, 711, 808-09, 844, 1081); Lakeland (NHSM-R854-55); Odenton; Cromwell's Woods; Sawmill Creek.

44. *Coluber constrictor constrictor* Linnaeus. Black racer. A common snake, frequenting open areas such as fields and sand-gravel pits. Linstead (MFG-R75); Green Haven (NHSM-R125); Annapolis (NHSM-R152); intersection Craine and Defense Hgwy. (NHSM-R176); nr. Linthicum Heights (NHSM-R626); Briarcliff (NHSM-R701); Joyce Station (NHSM-R726); Sawmill Creek; Fort Smallwood.

45. *Opheodrys aestivus* Linnaeus. Rough green snake. Common but infrequently observed because of its habit of frequenting bushes, vines, and shrubs, where it blends well with the surroundings. Linstead (MFG-R59), (NHSM-R 23, 109); nr. Gibson Island (NHSM-R88); Gibson Island (NHSM-R1005); Odenton; Orchard Beach; Manresa; Joyce Lane.

46. *Elaphe guttata guttata* Linnaeus. Corn snake. Frequently encountered in the central and southern portions of the county. Briarcliff (MFG-R96), (NHSM-R806); Gibson Island (NHSM-R892); Magovista (NHSM-R363); Arnold (NHSM-R743): nr. Annapolis (NHSM-R1457); Whitney's Landing (NHSM-R1586; seven specimens have been taken from this one locality); Lake Shore; nr. Priest's Bridge; Wardaur.

47. *Elaphe obsoleta obsoleta* Say. Pilot black snake. Recorded from: Arnold (NHSM-R68); Lakeland (NHSM-R610); Shore Acres (NHSM-R721); Pines (NHSM-R725); nr. Bristol (NHSM-R1442); Linstead; nr. sand-gravel pits; Severna Park; Crownsville.

48. *Lampropeltis calligaster rhombomaculata* Holbrook. Brown king or mole snake. Rare. Nr. Glen Burnie (NHSM-R1622); Annapolis Junction; Fort Meade; between Millersville and Odenton; nr. Pasadena; Friendship (Groves).

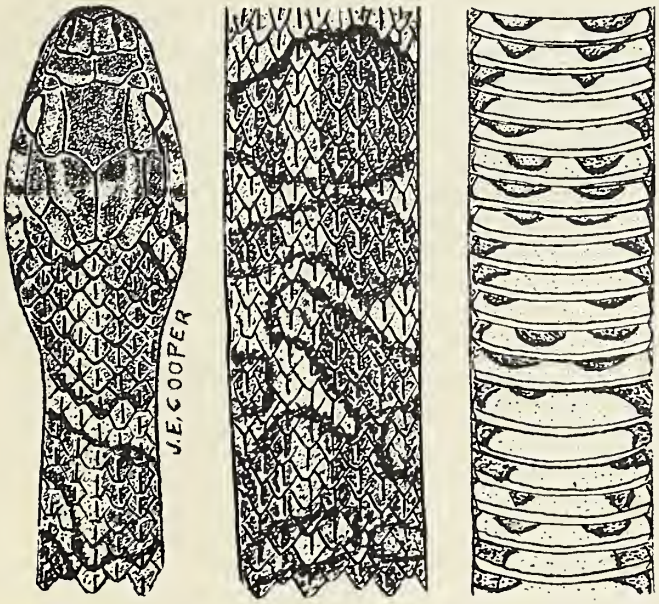
49. *Lampropeltis getulus getulus* Linnaeus. Common king snake. Commonly found in the central and southern parts of the county. Innumerable specimens were taken at Severna Park by Dr. Robert S. Simmons by laying out sheets of tin in an open field. Nr. Joyce Lane (NHSM-R901); Briarcliff (NHSM-R948); Priest's Bridge (NHSM-R1075); Marley Creek.

50. *Lampropeltis doliata* Linnaeus. Milk snake. Due to the paucity of specimens of the milk snake from Anne Arundel County, no subspecific status will be assigned to this form in these notes. Those specimens seen by the writer appear to be intergrades between *temporalis* and *triangulum*, but "pure" *temporalis* should be encountered in the southern part of the county. Peninsula between Rock and Stoney Crks. (NHSM-R1582); Briarcliff; Friendship; nr. Priest's Bridge; Lake Shore (alive at Baltimore Zoo).

51. *Cemophora coccinea* Blumenbach. Scarlet snake. Only three records exist for the county (Cooper, 1950, *Maryland Naturalist*. XX, No. 4, 67-69). One, recorded by Stejneger in 1905 from St. Margaret's, one found DOR $\frac{1}{4}$ mi. N. Priest's Bridge (NHSM-R716) by M. F. Groves and the writer, and a third collected on June 8, 1947 at Mill Creek near Arnold by Philip A. Butler.

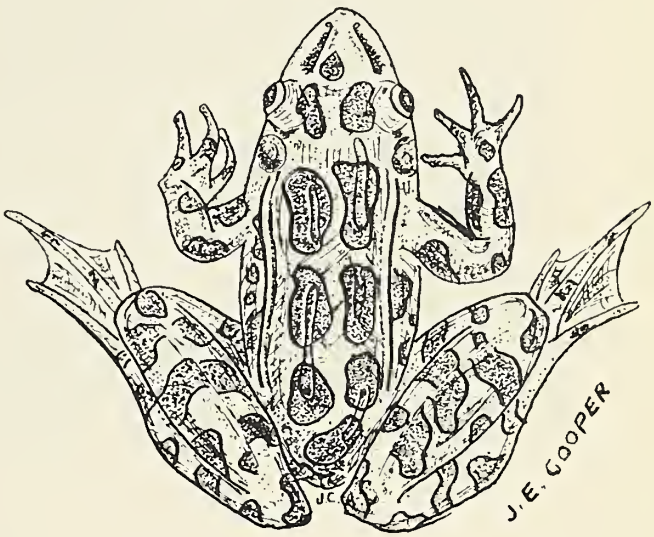
52. *Ancistrodon contortrix mokeson* Daudin. Copperhead. Frequently encountered, especially at Briarcliff and other areas near Arnold. Individuals were found in an old wall on a beach along the Severn River below Briarcliff. Two giant specimens, 45 and 47 inches long, were found crossing roads near Briarcliff at night. Another very large individual was found under a board in an abandoned barnyard near Joyce Lane. Briarcliff (NHSM-R685, 742, 796, 941-42, 945, 1031); Chase Creek nr. Briarcliff (MFG-R79); Fort Meade; Crownsville; Bell Haven Beach, Bodkin Creek. None of the specimens seen by the writer exhibit characteristics of the southern subspecies *contortrix*.

This gives us 22 species of amphibians and 30 species of reptiles indigenous to Anne Arundel County. Of these, 9 are salamanders, 3 are toads, 5 are "tree" frogs, 5 are "true" frogs, 6 are turtles, 5 are lizards, and 19 are snakes.



Northern Water Snake

Natrix sipedon sipedon

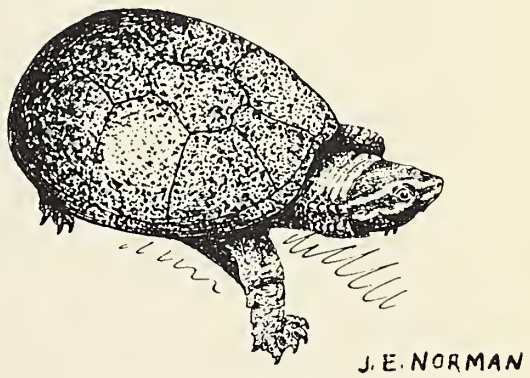


Pickerel Frog

Rana palustris

Spotted Salamander

Ambystoma maculatum



Musk Turtle

Sternotherus odoratus

Horse Drawn Cars At The Entrance To
The Frostburg Fireclay Mine

All photographs by author

THE FROSTBURG FIRE CLAY MINE AND ITS MINERALS

by Harold D. Levy[1]

In recent years, mineral collecting at the various mines and quarries near Baltimore has been unrewarding. Fine localities such as the Milford, Arundel, and Jones Falls quarries have been closed and mining is non-existent. Mine dumps of Maryland localities previously worked for valuable iron, copper, chrome, lead and gold have been weathering away. Only a few quarries now produce specimen material of any quality. Faced with this problem, the local collector has had to collect in neighboring states or look for new localities. Until recently, little work had been done in the western portion of our state. However, the writer has worked several of the localities in this region, and, despite the long distance which it is necessary to travel, much of the future collecting of the Department of Mineralogy will be done in western Maryland. This is the first in a series of reports planned on this area.

[1] Curator of Mineralogy, Natural History Society of Maryland

A Large Ore Ball at the Frostburg Fire Clay Mine

Strip Mine at the Frostburg Fire Clay Mine, Looking South

Situated some 150 miles west of Baltimore lie Garrett and Allegany Counties, the westernmost in Maryland. To reach them one must cross the Blue Ridge and part of the Allegheny mountain ranges. The entire geology of the area is sedimentary in nature. Rocks of the Quaternary, Permian, Carboniferous, and Devonian formations have been classified in the counties. Mountains up to 3000 feet dominate the topography. Mining and quarrying here are confined to coal, limestone for cement and road stone, and clay for fire brick. Fire clay mining has provided Maryland collectors with a fine locality.

The Frostburg Fire Clay Mine is situated on the eastern slope of Big Savage Mountain, two miles west of Frostburg, on U. S. Route 40. One may easily drive to the mine by going 2 miles past Water Street and turning right on a dirt road. The dumps and underground mine are at the end of this road, and further up the mountain can be seen the strip mining operation. Both hard "flint clay" and soft plastic clay are dug, since both are necessary in the manufacture of fire brick.

Geologically, the mine is in the Pottsville formation of the Carboniferous Era. A cross section of the area shows a layer of Homewood sandstone, a layer of shale, the fire clay, another layer of shale, and finally a layer of coal. Often in the fire clay are found iron carbonate nodules. These range from several inches to four feet in diameter. While the "ore balls", as they are called by the miners, make clay mining difficult, in some places where they were found in quantity the mines were worked as iron mines. This was around the 1850's.

The present Frostburg Fire Clay Mine was opened about the year 1906. Prior to this a mine was operated several hundred feet up the mountain. From the number of ore balls on the dumps of this older mine, it is apparent that the clay was recovered only with a great deal of effort. The present tunnel goes into the mountain several hundred yards and branches off at intervals. Clay is dug by miners in the stopes and loaded into horse drawn cars. These are taken out onto a loading platform, where the clay is dumped into trucks and hauled to the plant at nearby Allegany. The strip mine is a large opening near the summit of the mountain running in a north-south direction. The over-burden and clay are dug by power shovel; the sandstone and ore balls are dumped on extensive dumps below the mine and the clay is shipped to the plant. Between the

tunnel operation and the strip mine may be seen the dumps of the old clay mine. These are a fine source of mineral specimens.

Nearly all the minerals of the Frostburg mine are confined to the siderite nodules. While some of these are solid, most are hollow inside and lined with crystallized minerals. The nodules are very hard and a great deal of physical labor is required to open them. A sledge hammer and eye protector are a necessity. Although most of the minerals found at Frostburg are micro-mount material (i.e. require the use of a 20 or 40 power microscope) excellent hand specimens may also be collected. The mine is listed in Ostrander and Price (1940, *Minerals of Maryland*, Nat.-Hist. Soc. Md.) as being near Frostburg, and this publication states that siderite and barite had been reported from there. This information was obtained from Shaller (1906, "Siderite and Barite From Maryland," *Amer. Jour. Science*). In this paper Dr. Shaller gives a comprehensive crystallographic description of the two minerals, including the listing of several new crystal forms for siderite and barite. The specimens described were obtained from the Foote Mineral Company, an old Philadelphia mineral dealer. Recently, Mr. Paul Desautels, formerly of Philadelphia, now of the Towson State Teacher's College, Maryland, introduced local collectors to these two Frostburg minerals. After seeing them, several members of the Department of Mineralogy and I made numerous trips to the mine, in 1950, '51, '52, and '53, with excellent results. Last year two minerals new to the state were found at Frostburg.

LIST OF MINERALS

Siderite. This is by far the most common mineral at Frostburg. The carbonate of iron occurs first as the matrix for the suite of minerals to be found. It is very compact and impure, having a specific gravity of 3.7. In those nodules, which are not solid, the vugs are lined with siderite crystals - the crystals derived from the massive siderite. The size of the crystals ranges from very minute to one-half inch. The scalenohedron is the common habit. A drawing of this form may be seen in Dana's *System of Mineralogy*, 7th Edition, Volume II, p. 167. Most of the scalenohedral type crystals are attached to the matrix so that only the top portion can be seen. Some, however, were attached in such a manner as to display both terminations. Also found are rounded and flattened rhombohedrons (nail-head type). While the faces of the scalenohedrons are sharp and bright, the nail-head crystals are quite dull. Often, the surfaces of the crystals are coated with a brilliant iridescence. Mixed shades of blue, green, red, orange, and violet coating the siderite make for handsome cabinet specimens.

Barite. Barite at Frostburg is found in three different forms. The first is a compact massive form which is opaque and shows a very fine cleavage. The second is a sugary form composed of sub-microscopic crystals. The third is the fine transparent crystal form, measuring up to 3/4 inch in size. The form in which they are found is uncommon for barite, being elongated parallel to the "c" axis. Some twenty forms are present, making the crystals very complex. For the micro-mineral collectors these are probably the world's finest barites. Some tabular crystals of about 3/8 inch were collected. A hand specimen recently collected consisted of nice size crystals of barite on a matrix of oil-green siderite crystals.

Pyrite. Several specimens of micro-pyrite have been collected at Frostburg. The first observed were in the spring of 1952. These were in a badly weathered siderite nodule and consisted of twinned groups of tarnished crystals. In the fall of 1952 more micro-pyrite was collected, this time in association with fine transparent siderite crystals. The first group consisted only of the cube form; the second was more complex. While the cube was the dominant form, octahedron, dodecahedron, and tetrahexahedron were also present. Some of these specimens displayed a fine iridescence. While pyrite seems to be common at the Union Clay Mine at Grantsville, to my knowledge these are the only two reported finds at Frostburg.

Sphalerite. A few specimens of zinc sulfide were found at Frostburg on July 4, 1952. These are first occurrences for the locality. The sphalerite was found associated with millerite and siderite. Crystal faces were very distorted as the cavities in which they were found gave little room for growth. On a trip to the mine in the autumn of 1952 much massive sphalerite was collected as well as one well-defined tetrahedral crystal. The color of the sphalerite is most often yellowish-brown, but the single crystal was a light ruby-red.

Geothite. This mineral has been observed only in the southern end of the strip mine. It occurs in thin, shiny black, slightly botryoidal masses forming an outer shell for very large siderite nodules.

Quartz. This mineral was added to the locality list on the second trip to Frostburg. It is only found with the nail-head type siderite crystals. The crystal sizes run from 1/8 to 3/4 inch. Most often the crystals are the common singly terminated prismatic type. Recently several sceptre-type crystals were collected by Mr. Ned Blandford of the Virginia Mineralogical Society. Mr. Jack Kepper, of the Natural History Society of Maryland, found a doubly terminated "Herkimer diamond" crystal.

Marcasite. This mineral was found with the first pyrite collected at Frostburg. Only micro-size crystals were observed. Some of these were beautifully twined; others were in single twisted crystals. A great deal of massive marcasite may be seen on the coal found on the dumps.

Hematite. At Frostburg, hematite is not associated with the siderite. It occurs in a red earthy form.

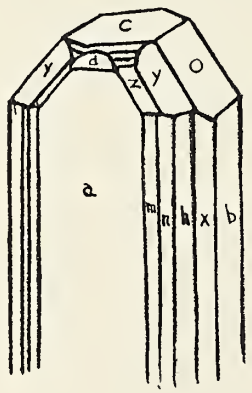
Limonite. Some of the siderite nodules which have been exposed to the weather alter to limonite. It may also be found in yellow ochreous masses.

Millerite. Mr. Ned Blandford found the first specimens of this mineral on the dumps of the original clay mine. This was the first reported occurrence of the nickel sulfide in Maryland. These specimens consisted of two siderites showing delicate divergent crystals; they were collected on May 8, 1952. On July 4, 1952, Mr. John Glaser, of this department, and I, found exceptional specimens at the southern end of the strip mine. Most of the hair-like crystal groups were about 1/2 inch in size. The prize of the group wasx a specimen of 1-3/4 inch crystals in a siderite vug.

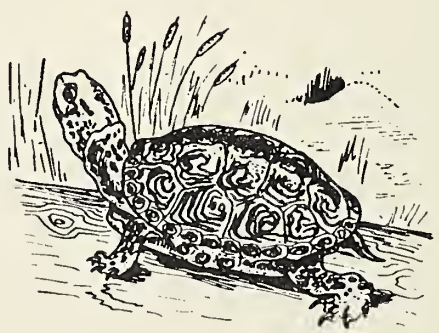
Galena. Only one micro-specimen of this mineral was collected. It was imbedded in the fine sugar-like barite, and showed the cubic cleavage typical of this mineral.

Dickite. Recently identified by the United States National Museum was the mineral dickite, an aluminum silicate. It occurs as sub-micro crystals coating siderite and quartz. These are pale yellow to white in color. This is the first reported find of crystallized dickite for the state of Maryland.

From a list of associated minerals which are generally found in siderite concreations, only arsenopyrite and chalcopyrite have not as yet been found. Further collecting will probably produce more minerals from this interesting locality. And there still are similar mines near Mt. Savage, Grantsville, and Ellerslie whose dumps have never "heard" the banging of a mineral hammer.



A TYPICAL FROSTBURG BARITE
CRYSTAL
(from Schaller, *Siderite and Barite from Maryland)*



Publications of
The Natural History Society of Maryland

A LIST OF THE BIRDS OF MARYLAND

Paper cover, 96 pages, 9 illustrations. A list of all the species of birds now known to occur in Maryland. Brief annotations give information concerning seasons of occurrence and regional distribution. Price $1.10

MINERALS OF MARYLAND

Paper cover, 92 pages, 20 illustrations. Contains check-list of all known minerals of Maryland and principal locations. Price $.80

SNAKES OF MARYLAND

Paper cover, 103 pages, 11 plates in color and 33 black and white. Contains identification keys and distribution map. Price $1.50

FAMILIAR BUTTERFLIES OF MARYLAND

Paper cover, 30 pages, 1 plate in color and 16 black and white plates illustrating 40 common butterflies of Maryland. Price $.20

FAMILIAR MOTHS OF MARYLAND

Paper cover, 19 pages, 9 plates illustrating 11 common moths, principally the larger species, found in Maryland. Price $.15

BIRDS OF BALTIMORE AND VICINITY

Paper cover, 24 pages, map. Contains arrival, departure and nesting dates; arranged according to seasonal groups. Space is provided for additional records. Price $.15

THE PERIODIC CICADA

Leaflet of 4 pages describing the complete life history of the "Seventeen Year Locust." Price $.08

No. 10. SOME INDIAN VILLAGE SITES IN LOWER PATAPSCO RIVER

Another excellently illustrated report on Indian artifacts from Anne Arundel County. 6 pages, 5 half-tones, 1 map. Price $.35

MARYLAND NATURE LEAFLETS

A series of 4 page leaflets, 8½" x 11", each profusely illustrated with line drawings, and with vocabulary especially adapted to middle high school grades. *Prices:* 8 cents each for ten or less; all over ten, 6 cents each, any assortment.

#1 Maryland Maples
#2 Maryland Salamanders
#3 Winter Birds in Maryland
#4 Maryland Frogs and Toads
#5 Queer Fishes of the Chesapeake
#6 Turtles of Maryland
#7 Spring Flowers in Maryland
#8 Common Fresh Water Fishes of Maryland
#9 Common Maryland Insects
#10 Our Maryland Indians
#11 Maryland Tree Frogs
#12 Introducing Maryland Mammals

SMITHSONIAN INSTITUTION LIBRARIES
3 9088 01371 7558

The Natural History Society of Maryland

Founded 1929

"To increase and diffuse knowledge of Natural History"

OFFICE, LABORATORIES and LECTURE ROOM
2101-2103 Bolton Street
Baltimore 17, Md.

Office Hours: Tuesday 10 A. M. to 4 P. M. *Telephone:* MAdison 3-9644
Open Tuesday, Friday and Saturday evenings from 8 to 10 P. M.